
**State of California
The Resources Agency
Department of Water Resources**

**INTERIM REPORT
SP-T4**

Biodiversity, Vegetation Communities and Wildlife Habitat Mapping

**Oroville Facilities Relicensing
FERC Project No. 2100**



JUNE 23, 2003

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FERC Project No. 2100**

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Preliminary Information – Subject to Revision – For Collaborative Process Purposes Only

REPORT SUMMARY

A vegetation cover map will be included in the license application to describe the botanical resources of the project-affected area. It is being used to plan other studies relating to botanical and wildlife resources and to assess a number of other issues of concern. Vegetative cover and land use data maps are a necessary tool for planning and determining management options. They can help identify areas that provide important habitat for threatened, endangered, or special status plant and animal species as well as help to determine which areas are vulnerable to habitat loss, degradation, or fragmentation due to project-related operations.

Vegetation cover/land-use and wildlife habitat maps were produced for the study area using a combination of field investigations and heads-up digitizing from true-color aerial photography. The study area includes the Project Area, a one-mile buffer around the Project Area, and the Feather River (FEMA 100-year floodplain) downstream of Oroville Dam.

A classification system of vegetation/land-use associations, based on the vegetation types used by the Holland classification system and those described in *A Manual of California Vegetation*, was developed for the study area. The system was modified and updated throughout the mapping process. These associations were converted to wildlife habitats/habitat stages using the California Wildlife Habitat Relationships (WHR) system.

Vegetation patterns were digitized from georeferenced aerial photography using ArcView software. Acreages of each broad-based vegetation/land-use category, vegetation/land-use associations, and WHR habitat types have been calculated for the Project Area, the one-mile buffer, and the Feather River floodplain downstream of the Lake Oroville.

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1.0 INTRODUCTION

1.1 BACKGROUND INFORMATION

A vegetation cover map will be included in the license application to describe the botanical resources of the project-affected area. It is being used to plan other studies relating to botanical and wildlife resources and to assess a number of other issues of concern. Vegetative cover and land use data maps are a necessary tool for planning and determining management options. They can help identify areas that provide important habitat for threatened, endangered, or special status plant and animal species as well as help to determine which areas are vulnerable to habitat loss, degradation, or fragmentation due to project-related operations.

1.1.1 Study Area

The study area included all areas within one mile of the FERC project boundary and downstream Feather River floodplain (within the FEMA 100-year floodplain) to the confluence with the Sacramento River.

1.2 DESCRIPTION OF FACILITIES

The Oroville Facilities were developed as part of the State Water Project (SWP), a water storage and delivery system of reservoirs, aqueducts, power plants, and pumping plants. The main purpose of the SWP is to store and distribute water to supplement the needs of urban and agricultural water users in northern California, the San Francisco Bay area, the San Joaquin Valley, and southern California. The Oroville Facilities are also operated for flood management, power generation, to improve water quality in the Delta, provide recreation, and enhance fish and wildlife.

FERC Project No. 2100 encompasses 41,100 acres and includes Oroville Dam and Reservoir, three power plants (Hyatt Pumping-Generating Plant, Thermalito Diversion Dam Power Plant, and Thermalito Pumping-Generating Plant), Thermalito Diversion Dam, the Feather River Fish Hatchery and Fish Barrier Dam, Thermalito Power Canal, Oroville Wildlife Area (OWA), Thermalito Forebay and Forebay Dam, Thermalito Afterbay and Afterbay Dam, and transmission lines, as well as a number of recreational facilities. An overview of these facilities is provided on Figure 1.2-1. The Oroville Dam, along with two small saddle dams, impounds Lake Oroville, a 3.5-million-acre-feet (maf) capacity storage reservoir with a surface area of 15,810 acres at its normal maximum operating level.

The hydroelectric facilities have a combined licensed generating capacity of approximately 762 megawatts (MW). The Hyatt Pumping-Generating Plant is the largest of the three power plants with a capacity of 645 MW. Water from the six-unit underground power plant (three conventional generating and three pumping-generating

units) is discharged through two tunnels into the Feather River just downstream of Oroville Dam. The plant has a generating and pumping flow capacity of 16,950 cfs and 5,610 cfs, respectively. Other generation facilities include the 3-MW Thermalito Diversion Dam Power Plant and the 114-MW Thermalito Pumping-Generating Plant.

Thermalito Diversion Dam, four miles downstream of the Oroville Dam creates a tail water pool for the Hyatt Pumping-Generating Plant and is used to divert water to the Thermalito Power Canal. The Thermalito Diversion Dam Power Plant is a 3-MW power plant located on the left abutment of the Diversion Dam. The power plant releases a maximum of 615 cubic feet per second (cfs) of water into the river.

The Power Canal is a 10,000-foot-long channel designed to convey generating flows of 16,900 cfs to the Thermalito Forebay and pump-back flows to the Hyatt Pumping-Generating Plant. The Thermalito Forebay is an off-stream regulating reservoir for the 114-MW Thermalito Pumping-Generating Plant. The Thermalito Pumping-Generating Plant is designed to operate in tandem with the Hyatt Pumping-Generating Plant and has generating and pump-back flow capacities of 17,400 cfs and 9,120 cfs, respectively. When in generating mode, the Thermalito Pumping-Generating Plant discharges into the Thermalito Afterbay, which is contained by a 42,000-foot-long earth-fill dam. The Afterbay is used to release water into the Feather River downstream of the Oroville Facilities, helps regulate the power system, provides storage for pump-back operations, and provides recreational opportunities. Several local irrigation districts receive water from the Afterbay.

The Feather River Fish Barrier Dam is downstream of the Thermalito Diversion Dam and immediately upstream of the Feather River Fish Hatchery. The flow over the dam maintains fish habitat in the low-flow channel of the Feather River between the dam and the Afterbay outlet, and provides attraction flow for the hatchery. The hatchery was intended to compensate for spawning grounds lost to returning salmon and steelhead trout from the construction of Oroville Dam. The hatchery can accommodate 16,000 to 24,000 adult fish annually.

The Oroville Facilities support a wide variety of recreational opportunities. They include: boating (several types), fishing (several types), fully developed and primitive camping (including boat-in and floating sites), picnicking, swimming, horseback riding, hiking, off-road bicycle riding, wildlife watching, hunting, and visitor information sites with cultural and informational displays about the developed facilities and the natural environment. There are major recreation facilities at Loafer Creek, Bidwell Canyon, the Spillway, North and South Thermalito Forebay, and Lime Saddle. Lake Oroville has two full-service marinas, five car-top boat launch ramps, ten floating campsites, and seven dispersed floating toilets. There are also recreation facilities at the Visitor Center and the OWA.

The OWA comprises approximately 11,000-acres west of Oroville that is managed for wildlife habitat and recreational activities. It includes the Thermalito Afterbay and surrounding lands (approximately 6,000 acres) along with 5,000 acres adjoining the Feather River. The 5,000 acre area straddles 12 miles of the Feather River, which includes willow and cottonwood lined ponds, islands, and channels. Recreation areas include dispersed recreation (hunting, fishing, and bird watching), plus recreation at developed sites, including Monument Hill day use area, model airplane grounds, three boat launches on the Afterbay and two on the river, and two primitive camping areas. California Department of Fish and Game's (DFG) habitat enhancement program includes a wood duck nest-box program and dry land farming for nesting cover and improved wildlife forage. Limited gravel extraction also occurs in a number of locations.

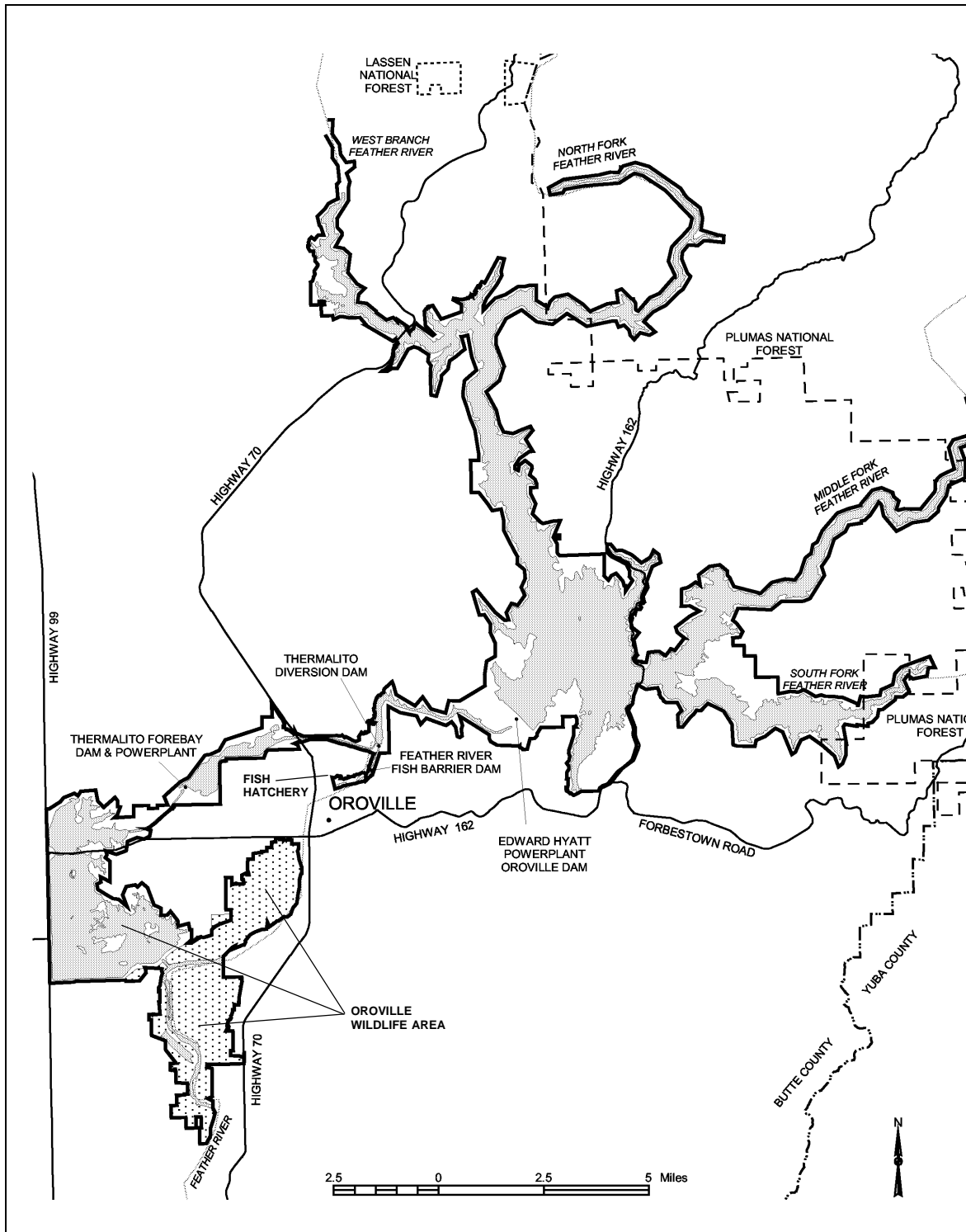


Figure 1.2-1. Oroville Facilities FERC Project Boundary

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1.3 CURRENT OPERATIONAL CONSTRAINTS

Operation of the Oroville Facilities varies seasonally, weekly and hourly, depending on hydrology and the objectives DWR is trying to meet. Typically, releases to the Feather River are managed to conserve water while meeting a variety of water delivery requirements, including flow, temperature, fisheries, recreation, diversion and water quality. Lake Oroville stores winter and spring runoff for release to the Feather River as necessary for project purposes. Meeting the water supply objectives of the SWP has always been the primary consideration for determining Oroville Facilities operation (within the regulatory constraints specified for flood control, in-stream fisheries, and downstream uses). Power production is scheduled within the boundaries specified by the water operations criteria noted above. Annual operations planning is conducted for multi-year carry over. The current methodology is to retain half of the Lake Oroville storage above a specific level for subsequent years. Currently, that level has been established at 1,000,000 acre-feet (af); however, this does not limit draw down of the reservoir below that level. If hydrology is drier than expected or requirements greater than expected, additional water would be released from Lake Oroville. The operations plan is updated regularly to reflect changes in hydrology and downstream operations. Typically, Lake Oroville is filled to its maximum annual level of up to 900 feet above mean sea level (msl) in June and then can be lowered as necessary to meet downstream requirements, to its minimum level in December or January. During drier years, the lake may be drawn down more and may not fill to the desired levels the following spring. Project operations are directly constrained by downstream operational constraints and flood management criteria as described below.

1.3.1 Downstream Operation

An August 1983 agreement between DWR and DFG entitled, "Agreement Concerning the Operation of the Oroville Division of the State Water Project for Management of Fish & Wildlife," sets criteria and objectives for flow and temperatures in the low flow channel and the reach of the Feather River between Thermalito Afterbay and Verona. This agreement: (1) establishes minimum flows between Thermalito Afterbay Outlet and Verona which vary by water year type; (2) requires flow changes under 2,500 cfs to be reduced by no more than 200 cfs during any 24-hour period, except for flood management, failures, etc.; (3) requires flow stability during the peak of the fall-run Chinook spawning season; and (4) sets an objective of suitable temperature conditions during the fall months for salmon and during the later spring/summer for shad and striped bass.

1.3.1.1 Instream Flow Requirements

The Oroville Facilities are operated to meet minimum flows in the Lower Feather River as established by the 1983 agreement (see above). The agreement specifies that Oroville Facilities release a minimum of 600 cfs into the Feather River from the

Thermalito Diversion Dam for fisheries purposes. This is the total volume of flows from the diversion dam outlet, diversion dam power plant, and the Feather River Fish Hatchery pipeline.

Generally, the instream flow requirements below Thermalito Afterbay are 1,700 cfs from October through March, and 1,000 cfs from April through September. However, if runoff for the previous April through July period is less than 1,942,000 af (i.e., the 1911-1960 mean unimpaired runoff near Oroville), the minimum flow can be reduced to 1,200 cfs from October to February, and 1,000 cfs for March. A maximum flow of 2,500 cfs is maintained from October 15 through November 30 to prevent spawning in overbank areas that might become de-watered.

1.3.1.2 Temperature Requirements

The Diversion Pool provides the water supply for the Feather River Fish Hatchery. The hatchery objectives are 52°F for September, 51°F for October and November, 55°F for December through March, 51°F for April through May 15, 55°F for last half of May, 56°F for June 1-15, 60°F for June 16 through August 15, and 58°F for August 16-31. A temperature range of plus or minus 4°F is allowed for objectives, April through November.

There are several temperature objectives for the Feather River downstream of the Afterbay Outlet. During the fall months, after September 15, the temperatures must be suitable for fall-run Chinook. From May through August, they must be suitable for shad, striped bass, and other warmwater fish.

The National Marine Fisheries Service has also established an explicit criterion for steelhead trout and spring-run Chinook salmon. Memorialized in a biological opinion on the effects of the Central Valley Project and SWP on Central Valley spring-run Chinook and steelhead as a reasonable and prudent measure; DWR is required to control water temperature at Feather River mile 61.6 (Robinson's Riffle in the low-flow channel) from June 1 through September 30. This measure requires water temperatures less than or equal to 65°F on a daily average. The requirement is not intended to preclude pump-back operations at the Oroville Facilities needed to assist the State of California with supplying energy during periods when the California ISO anticipates a Stage 2 or higher alert.

The hatchery and river water temperature objectives sometimes conflict with temperatures desired by agricultural diverters. Under existing agreements, DWR provides water for the Feather River Service Area (FRSA) contractors. The contractors claim a need for warmer water during spring and summer for rice germination and growth (i.e., 65°F from approximately April through mid May, and 59°F during the remainder of the growing season). There is no obligation for DWR to meet the rice

water temperature goals. However, to the extent practical, DWR does use its operational flexibility to accommodate the FRSA contractor's temperature goals.

1.3.1.3 Water Diversions

Monthly irrigation diversions of up to 190,000 (July 2002) af are made from the Thermalito Complex during the May through August irrigation season. Total annual entitlement of the Butte and Sutter County agricultural users is approximately 1 maf. After meeting these local demands, flows into the lower Feather River continue into the Sacramento River and into the Sacramento-San Joaquin Delta. In the northwestern portion of the Delta, water is pumped into the North Bay Aqueduct. In the south Delta, water is diverted into Clifton Court Forebay where the water is stored until it is pumped into the California Aqueduct.

1.3.1.4 Water Quality

Flows through the Delta are maintained to meet Bay-Delta water quality standards arising from DWR's water rights permits. These standards are designed to meet several water quality objectives such as salinity, Delta outflow, river flows, and export limits. The purpose of these objectives is to attain the highest water quality, which is reasonable, considering all demands being made on the Bay-Delta waters. In particular, they protect a wide range of fish and wildlife including Chinook salmon, Delta smelt, striped bass, and the habitat of estuarine-dependent species.

1.3.2 Flood Management

The Oroville Facilities are an integral component of the flood management system for the Sacramento Valley. During the wintertime, the Oroville Facilities are operated under flood control requirements specified by the U.S. Army Corps of Engineers (USACE). Under these requirements, Lake Oroville is operated to maintain up to 750,000 af of storage space to allow for the capture of significant inflows. Flood control releases are based on the release schedule in the flood control diagram or the emergency spillway release diagram prepared by the USACE, whichever requires the greater release. Decisions regarding such releases are made in consultation with the USACE.

The flood control requirements are designed for multiple use of reservoir space. During times when flood management space is not required to accomplish flood management objectives, the reservoir space can be used for storing water. From October through March, the maximum allowable storage limit (point at which specific flood release would have to be made) varies from about 2.8 to 3.2 maf to ensure adequate space in Lake Oroville to handle flood flows. The actual encroachment demarcation is based on a wetness index, computed from accumulated basin precipitation. This allows higher levels in the reservoir when the prevailing hydrology is dry while maintaining adequate flood protection. When the wetness index is high in the basin (i.e., wetness in the

watershed above Lake Oroville), the flood management space required is at its greatest amount to provide the necessary flood protection. From April through June, the maximum allowable storage limit is increased as the flooding potential decreases, which allows capture of the higher spring flows for use later in the year. During September, the maximum allowable storage decreases again to prepare for the next flood season. During flood events, actual storage may encroach into the flood reservation zone to prevent or minimize downstream flooding along the Feather River.

2.0 NEED FOR STUDY

A vegetation cover map will be included in the license application to describe the botanical resources of the project-affected area. These vegetation cover and wildlife habitat maps are being used to plan other studies related to botanical and wildlife resources and to assess a number of other issues of concern including 1) extent and acreages of plant communities and wildlife habitat (SP T1); 2) endangered or threatened species habitat (SP T2); 3) riparian and wetlands habitat (SP T3/5); 4) development of a wildlife management plan (SP T6); 5) recreation and wildlife (SP T9); 6) upland plant communities, revegetation and restoration (SP T10); and 7) fuels and fire prevention (SP T11). The maps will be used by a number of other Work Group studies, including Land Use, Recreation, and Fisheries. These mapping efforts will be coordinated with the mapping studies in SP T7 (noxious weeds).

3.0 STUDY OBJECTIVE(S)

The objectives of this study are to 1) complete plant community and wildlife habitat mapping for evaluating project related effects on biological resources and 2) provide ecological data on the existing conditions and project related effects on vegetation and wildlife resources associated with the project pursuant to the CEQA, NEPA, and FERC regulatory framework.

4.0 METHODOLOGY

Vegetative cover and wildlife habitat maps were produced for the study area using a combination of field investigations and true-color aerial photography to interpret and delineate the vegetation and wildlife habitat types.

4.1 TASK 1: AERIAL PHOTOGRAPHY PREPARATION.

Aerial photography of the project area was taken for the Department of Water Resources in 1996 and 1999. The 1996 photos of Lake Oroville were taken at a scale of 1:12000. In 1999, the project area below the dam was taken at a scale of 1:12000. In October 2001, aerial photos were taken of the Feather River from the Fish Barrier Dam to the confluence with the Sacramento River. These were taken at a scale of 1:7200. Small areas of both the one-mile buffer and the FEMA 100-year floodplain of the Feather River downstream of the Project area were not covered by the above photos. Digital Ortho-Quarter Quads (DOQQ's) and aerial photography flown for Butte County were used to fill in those gaps. Table 4.1-1 identifies each set of aerial photography used in this study, the date the photos were taken, the scale they were taken at, the resolution they were scanned at, and the resulting pixel size.

Table 4.1-1. Aerial photography used for study

Area/ Photos	Date Flown	Scale	Scanned/Pixel Size
Lake Oroville	4/25/96	1:12,000	600 dpi / 0.5m pixel size
PA below Lake	12/4/99	1:12,000	600 dpi / 0.5m pixel size
Feather River	10/31/01	1:7,200	600 dpi/ 0.3m pixel size
DOQQ's	1993/1998	1:12,000	1:40,000 scale photography georeferenced to 1:12,000 scale accuracy 1 m pixel size
Butte County	2/2002	1:24,000	/ 1.2 m pixel size

The scanned images were orthorectified using ER Mapper software. The base grid used was UTM Zone 10, NAD 83.

4.2 TASK 2: LIST OF VEGETATION TYPES THAT OCCUR WITHIN THE STUDY AREA.

A draft classification system was developed by botanical staff familiar with the project area. This initial classification system was developed using a combination of field reconnaissance, literature search, aerial photographs, California Natural Diversity Database ecology files, and a review of existing vegetation classification and maps of the project area. The classification system is based on the vegetation types used by the Holland vegetation classification system (Holland, 1986) and those described in A

Manual of California Vegetation (Sawyer and Keeler-Wolf 1995), as well as conversations with Todd Keeler-Wolf, Resource Ecologist with the Department of Fish and Game. The initial classification scheme was modified and updated as the vegetation mapping progressed and field data were collected for this study as well as other terrestrial studies.

4.3 TASK 3: VEGETATION MAPPING AND ACCURACY ASSESSMENT.

Vegetation patterns were digitized from georeferenced aerial photography using ArcView software. The Habitat Digitizer Extension to ArcView 3.1 designed by the National Oceanic Atmospheric Administration (NOAA Website 2001) was used to delineate habitats using a hierarchical classification scheme. The project was digitized as three separate files due to the large size of the study area. These included 1) Lake Oroville, 2) the Project area below the dam, and 3) the downstream Feather River (FEMA 100-year floodplain) to the confluence with the Sacramento River. A one-mile buffer was mapped around the Project Area. The Lake Oroville area was interpreted and digitized by Barbara Castro and Lawrence Janeway. The Project Area below the dam and the Feather River floodplain was digitized and interpreted by Gail Kuenster. Digitizing was typically performed at a scale of 1:2,000, however, larger scales up to 1:600 were used to determine some unique features. The zoom-in feature was used frequently to interpret vegetation types. A minimum mapping unit for upland vegetation types was set at 0.5 acre. Other unique cover types such as ponds, riparian and other wetland habitats were mapped as small as 0.1 acre. A small number of polygons are below the general 0.5 acre minimum (or 0.1 acre for special features). These resulted from either "special vegetation signatures" or from the clips of the project area, 1 mile buffer, and Feather River floodplain made at the end of the mapping process. Thus a polygon may have been 0.5 acres or more when drawn (or 0.1 acre for special features), but when clipped, one or both of the resulting polygons may be less than the minimum mapping unit. Each polygon was labeled with vegetation and canopy cover type attributes and the resulting WHR category with canopy closure, size and height class, and zone information. Data collected during initial field reconnaissance were used to better prepare the persons digitizing for interpreting the vegetation patterns.

An accuracy assessment of the aerial photography interpretation for the vegetation and density classes has and is being conducted along with other botanical surveys. These will continue through the summer 2003. This data will be used to update and/or change polygon designations.

4.4 TASK 4: CULTURALLY IMPORTANT PLANT SPECIES.

A list of culturally important plant species to local Native Americans that have potential for occurring in the Project Area was obtained from the Cultural Resources Work Group. Significant populations of important species that occur within the Project boundary and downstream Feather River floodplain have been field mapped in combination with other

surveys for special status species, noxious weed, and riparian studies. This mapping effort is ongoing and will continue through the summer of 2003. These locations will be transferred to a data layer in a GIS database. This information will be provided to the Cultural Resources Work Group. The data collected thus far has not been entered into a GIS database and won't be presented in this report

4.5 TASK 5: PLANT SPECIES LIST.

All terrestrial and aquatic plant species encountered during botanical field surveys (T2, T3/5, T4, T7, and T10) will be identified (if possible). A list of plant species that occur within the FERC project boundary will be compiled. A separate list will be compiled for the downstream Feather River floodplain.

The species lists are not compiled at this time and will not be presented in this report.

4.6 TASK 6: CALIFORNIA WILDLIFE HABITAT RELATIONSHIPS (WHR)

The classification system used by the California WHR System and Supplement (Mayer and Laudenslayer 1988) was developed to predict wildlife habitat relationships. It provides a crosswalk (Parisi 1998) used by WHR to those used in other vegetation classification systems such as those developed by Holland (1986) and Sawyer and Keeler-Wolf (1995). The vegetation communities developed for the project area under Task 3 were converted to the wildlife habitat classification system. These cover types were further classified through aerial photo interpretation and field surveys. Habitat stages are defined according to percent canopy closure and average diameter at breast height (dbh) for tree-dominated habitats. Shrub habitats are defined by percent canopy closure and crown decadence. Herbaceous habitats are defined by canopy closure and height class. Aquatic types, which include lacustrine and riverine, are characterized by the substrate and how long it is submerged (open water to shore).

Because of the large size of the study area and the complexity of vegetation, as well as access problems, the sample size used to do the initial mapping for the Lake Oroville area was taken from surveys taken only in the West Branch of the Feather River. WHR size classes for shrub and tree types for the Lake Oroville area were based on an approximately 12% field sampling of most vegetation types in the West Branch Feather River area. The dbh values, averaged over all species and transects for a vegetation type in the West Branch area, were applied to that type for the entire Lake Oroville study area. In most cases, one size class predominated and was applied to all corresponding WHR types for the mapping area above the dam. WHR cover classes were taken from field plot data and photo interpretation estimates based on ground coverage by the highest relevant canopy (i.e. the tree layer in a tree/shrub vegetation type) visible in the aerial photos (Castro 2003).

In the Project Area below Lake Oroville and downstream Feather River floodplain, canopy closure and dbh values were field checked for approximately 50% of the mapped area prior to vegetation mapping. This data was taken during special status species surveys for the Project Area and riparian studies along the Feather River.

Site visits are being conducted on polygons of each habitat type throughout the Project Area to further update the canopy closure and size class information. In addition, field measurements are being taken to describe the habitat's structural condition.

4.7 TASK 7: VEGETATION COVER/HABITAT TYPE ACREAGES AND LOCATION MAPS

Plant community and wildlife habitat maps have been produced. The number of acres of each plant community (including open water categories and disturbed sites) has been tabulated. Special features (such as wetlands and/or vernal maps) will be generated as more data is gathered from this year's surveys.

4.8 TASK 8: CALIFORNIA WILDLIFE HABITAT RELATIONS ANALYSIS

CWHR predictions will be used to determine the species diversity represented by each size and density class or height and zone of each habitat type. This task has not been completed.

4.9 TASK 9: ANALYSIS OF PROJECT EFFECTS.

The analysis of project effects has not been completed.

5.0 STUDY RESULTS

This report is an account of progress to date. Tasks 4, 5, and 8 have been initiated but are not complete. No results are presented in this report for Tasks 4, 5, 8, and 9.

5.1 TASK 2: CLASSIFICATION SYSTEM

The vegetation classification system developed for the study area is presented in Table 5.1-1. A total of eight broadly defined vegetation or land-use categories were identified. These were further classified into 79 different associations. Five associations were classified as aquatic/submerged types. These included free-floating or rooted-submerged aquatic species that were easily seen on the aerial photographs. Nine of the associations were agricultural types, including one Ponderosa Pine plantation category. The disturbed/other category covered five associations including both natural disturbance areas such as gravel/sandbar and rock outcrops to areas where the natural vegetation is impacted by human activities (Urban, gravel tailings, and disturbed). Five associations were included in the open water category, 12 in riparian forest/woodland, 8 in the riparian shrub/scrub, 22 in upland forest/woodland, 2 in upland shrub/scrub, 4 in upland herbaceous, and 7 in the wetland category. An unknown category was applied to a small number of polygons. These will be ground checked and assigned a new association. Vegetation associations were based on a single species (i.e. Fremont cottonwood riparian forest) or two species (i.e. cottonwood/black willow riparian forest) whenever possible. These associations had one or two species dominating at least 60-70% percent of the canopy cover. Associations with "mixed" in the name or were non-species specific were vegetation types that had three or more equally dominant species in the canopy and/or ones that we were unable to discern what species were present from the aerial photography and no field data was available. A description of each association is presented in Appendix A (this is partially complete at this time). The completed list will be included in the Final Report, but will be available upon request from the author by July 15, 2003. Mapping of vernal pool/swale complexes and other small wetland features is not completed at this time. Most vernal pool/wetlands were included as part of the California annual grassland association.

Table 5.1-1. Vegetation classification system developed for the Oroville Relicensing Project study area

Vegetation/Land-Use Category	Vegetation Association
Aquatic/Submerged	
	Algae
	Mixed aquatic
	Mosquito fern
	Water primrose
	Water-meal
Disturbed/Agriculture	
	Eucalyptus

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Vegetation/Land-Use Category	Vegetation Association
	Fallow field
	Hayfield
	Orchard
	Pasture
	Plantation
	Rice
	Row crops
	Vineyard
Disturbed/Other	
	Disturbed
	Gravel tailings
	Gravel/sandbar
	Rock outcrop
	Urban
Open Water	
	Canal
	Lake
	Pond
	Riverine
	Slough
Riparian Forest/Woodland	
	Black willow riparian forest
	Black willow/blackberry scrub
	Black willow/white alder riparian forest
	Cottonwood/black willow riparian forest
	Disturbed riparian forest
	Foothill/montane mixed riparian forest
	Fremont cottonwood riparian forest
	Mixed willow riparian forest
	Non-native riparian forest
	Valley mixed riparian forest
	Valley oak riparian forest
	Valley oak/cottonwood riparian forest
Riparian Shrub/Scrub	
	Arundo scrub
	Blackberry scrub
	Blackberry/willow scrub
	Elderberry riparian scrub
	Mixed riparian scrub
	Mixed willow scrub
	Narrowleaf willow scrub
	Non-native riparian scrub
Upland Forest/Woodland	
	Black oak woodland
	Blue oak woodland
	Blue oak woodland/chaparral
	Blue oak-foothill pine woodland
	Blue oak-foothill pine woodland/chaparral
	Canyon live oak woodland

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Vegetation/Land-Use Category	Vegetation Association
	Douglas fir forest
	Foothill pine woodland/chaparral
	Foothill pine-mixed oak woodland
	Foothill pine-mixed oak woodland/chaparral
	Mixed conifer forest
	Mixed conifer-hardwood forest
	Mixed oak woodland
	Mixed oak woodland/chaparral
	Mixed pine woodland/chaparral
	Mixed pine-mixed oak woodland
	Mixed pine-mixed oak woodland/chaparral
	Ponderosa pine forest
	Ponderosa pine-Douglas fir forest
	Ponderosa pine-mixed oak woodland
	Ponderosa pine-mixed oak woodland/chaparral
	Valley oak woodland
Upland Herbaceous	
	California annual grassland
	Disturbed grassland
	Short forbland
	Tall forbland
Upland Shrub/Scrub	
	Mixed chaparral
	Whiteleaf manzanita chaparral
Wetland	
	Bulrush
	Cattail
	Mixed emergent vegetation
	Rush
	Rush/Verbena
	Seep/wet area
	Verbena

5.2 TASK 3/TASK7 – VEGETATION MAPPING AND ACCURACY ASSESSMENT AND RESULTING DATA

Vegetation mapping for the Project Area, including a mile buffer around the Project Area, and the downstream Feather River (FEMA 100-year floodplain) to the confluence with the Sacramento River has been completed. Field data collected during other botanical studies will result in some changes to the current mapping product.

An accuracy assessment based on field data collection will be completed this summer. Because of the complexity of the vegetation maps, a partial accuracy assessment method will be employed. This type of sampling was developed by Todd Keeler-Wolf, et.al of the California Department of Fish and Game (CDFA 1998, 2000).

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The study area included approximately 173,500 acres. The total number of acres mapped for each area was 1) 41,185.0 within the Oroville Relicensing project area; 2) 31,878.3 within the Feather River FEMA 100-year floodplain; and 3) 100,522.7 within the one-mile buffer around the project area. The Feather River floodplain includes all of the floodplain outside the project boundary downstream of the Dam. The Feather River floodplain area that occurs within the project boundary is included in the Project Area mapping. A portion of the Feather River floodplain acres that overlap with the one-mile buffer is included in both the One-mile buffer and Feather River floodplain totals. Vegetation mapping included canopy closure class densities. The canopy classes used were identical to those used in California WHR classification system (Task 6) for ease of cross walking the data from the vegetation mapping to the WHR categories.

The numbers of acres that occur within each of the broad vegetation and land-use categories for each of the three mapped areas are presented in Table 5.2-1. The number of acres for each association within these categories is presented in Table 5.2-2. Vegetation totals based on canopy closure classes is not presented in this report but is available upon request.

Table 5.2-1. Acreages of general vegetation/land-use categories mapped within the study area

Vegetation/Land-Use Category	Acreage		
	Project Area	One-Mile Buffer	Feather River Floodplain
Aquatic/Submerged	443.2	33.3	89.9
Disturbed/Agriculture	152.1	10063.4	16173.9
Disturbed/Other	2338.2	11320.1	3084.0
Open Water	19826.1	766.7	3150.6
Riparian Forest/Woodland	3245.6	1042.8	4268.6
Riparian Shrub/Scrub	204.1	285.9	2175.5
Upland Forest/Woodland	11077.1	62145.0	64.3
Upland Herbaceous	2751.2	12216.1	2661.4
Upland Shrub/Scrub	229.9	2288.6	
Wetland	917.5	347.5	210.1
Unknown		13.3	
Total Acres	41,185.0	100,522.7	31,878.3

Table 5.2-2. Acreages of vegetation/land-use associations found within the study area

	Vegetation Type	Acreage		
		Project Area	One-Mile Buffer	Feather R Floodplain
Aquatic/Submerged				
	Algae	2.14	3.83	2.6
	Mixed aquatic	14.99	2.58	11.1
	Mosquito fern	8.32	3.85	0.2
	Water primrose	398.52	19.76	68.6
	Water-meal	19.21	3.31	7.3
Disturbed/Agriculture				
	Eucalyptus	2.56	67.48	5.0
	Fallow field	4.19	45.79	697.4
	Hayfield	6.23	443.78	346.9
	Orchard	32.23	3970.01	10484.8
	Pasture	0.87	253.06	
	Plantation		601.64	
	Rice	6.89	4369.76	4414.1
	Row crops	98.33	266.58	223.5
	Vineyard	0.82	45.24	2.2
Disturbed/Other				
	Disturbed	738.57	725.82	149.0
	Gravel tailings	594.88	411.60	31.0
	Gravel/sandbar	67.79	115.22	520.6
	Rock outcrop	46.04	673.87	2.2
	Urban	890.93	9393.59	2381.2
Open Water				
	Canal	104.01	66.87	10.2
	Lake	19091.36	194.45	
	Pond	319.98	190.13	274.3
	Riverine	310.77	315.23	2794.2
	Slough			71.8
Riparian Forest/Woodland				
	Black willow riparian forest	1.39	1.93	2.0
	Black willow/blackberry scrub	0.14	3.73	
	Black willow/white alder riparian forest	0.32	2.47	2.4
	Cottonwood/black willow riparian forest	113.44	31.62	92.5
	Disturbed riparian forest	0.35	4.26	1.3
	Foothill/montane mixed riparian forest	50.71	445.49	
	Fremont cottonwood riparian forest	2452.79	145.09	634.8
	Mixed willow riparian forest	99.53	19.80	37.7
	Non-native riparian forest	6.66	4.45	5.4
	Valley mixed riparian forest	502.09	361.15	3198.6
	Valley oak riparian forest	18.21	22.79	114.4
	Valley oak/cottonwood riparian forest			179.4
Riparian Shrub/Scrub				
	Arundo scrub			1.2

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	Vegetation Type	Acreage		
		Project Area	One-Mile Buffer	Feather R Floodplain
	Blackberry scrub	6.71	41.31	51.0
	Blackberry/willow scrub	5.89	5.71	
	Elderberry riparian scrub	5.56		
	Mixed riparian scrub	87.23	97.70	1103.2
	Mixed willow scrub	58.99	68.12	471.8
	Narrowleaf willow scrub	18.39	15.90	537.4
	Non-native riparian scrub	21.29	57.13	10.9
Upland Forest/Woodland				
	Black oak woodland	41.09	281.13	
	Blue oak woodland	472.10	3397.23	
	Blue oak woodland/chaparral	282.66	1142.04	
	Blue oak-foothill pine woodland	412.42	1122.78	
	Blue oak-foothill pine woodland/chaparral	667.17	1086.75	
	Canyon live oak woodland	579.94	1256.03	
	Douglas fir forest	158.04	2578.67	
	Foothill pine woodland/chaparral	25.55	361.55	
	Foothill pine-mixed oak woodland	994.41	3082.30	4.3
	Foothill pine-mixed oak woodland/chaparral	1448.18	4900.04	
	Mixed conifer forest		854.28	
	Mixed conifer-hardwood forest	344.31	3575.60	
	Mixed oak woodland	1499.20	5294.07	0.5
	Mixed oak woodland/chaparral	1186.32	7076.08	
	Mixed pine woodland/chaparral	7.34	305.45	
	Mixed pine-mixed oak woodland	289.73	1344.97	
	Mixed pine-mixed oak woodland/chaparral	1008.41	7464.39	
	Ponderosa pine forest	2.98	592.29	
	Ponderosa pine-Douglas fir forest	110.67	2677.91	
	Ponderosa pine-mixed oak woodland	951.27	6556.55	
	Ponderosa pine-mixed oak woodland/chaparral	582.33	7043.30	
	Valley oak woodland	13.03	151.62	59.5
Upland Herbaceous				
	California annual grassland	2208.59	10664.60	141.9
	Disturbed grassland	486.21	1539.64	55.9
	Short forbland	55.17	11.86	1785.1
	Tall forbland	1.18		678.5
Upland Shrub/Scrub				
	Mixed chaparral	135.61	980.59	
	Whiteleaf manzanita chaparral	94.28	1308.01	
Wetland				
	Bulrush	0.33		
	Cattail	0.55	0.53	0.4
	Mixed emergent vegetation	292.13	166.27	209.7
	Rush	380.95	0.93	
	Rush/Verbena	200.77		
	Seep/wet area	6.76	179.74	
	Verbena	36.06		

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	Vegetation Type	Acreage		
		Project Area	One-Mile Buffer	Feather R Floodplain
	Unknown		13.33	

The size of the study area and the complexity of the vegetation make it impossible to depict the entire mapping product by vegetation associations in this report. Maps and the resulting GIS layers will be available upon request. Figures 5.2-1, 5.2-2, 5.2-3, and 5.2-4 depict the broad vegetation/land-use categories for the project area. Examples of the mapped vegetation associations for select areas in the study area are depicted in Figures 5.2-5, 5.2-6, and 5.2-7.

Figure 5.2-1 Vegetation/Land-use Categories Mapped in Project Area Below Lake Oroville

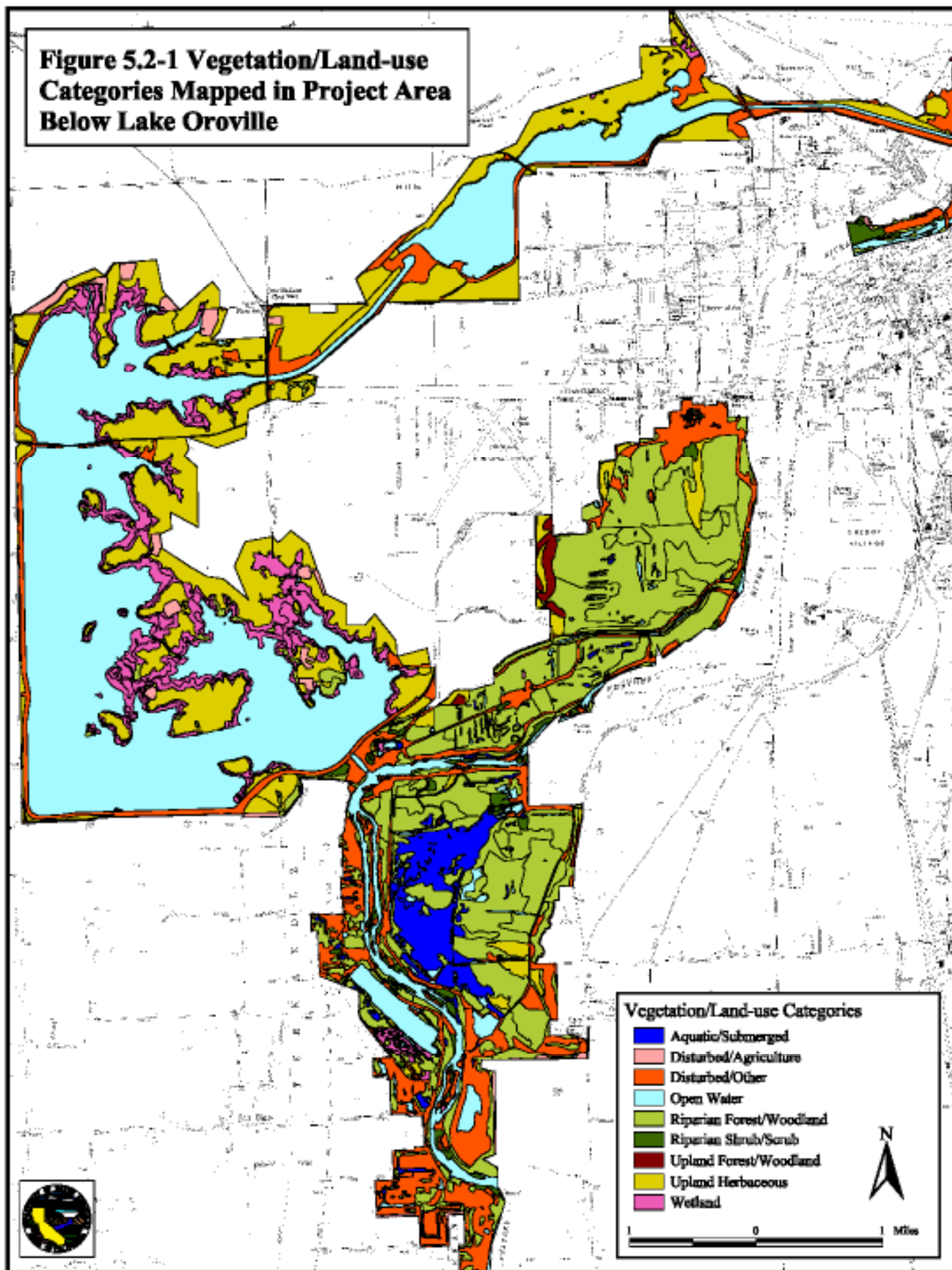


Figure 5.2-2 Vegetation/Land-use Categories Mapped in Project Area in Vicinity of Main Body of Lake Oroville

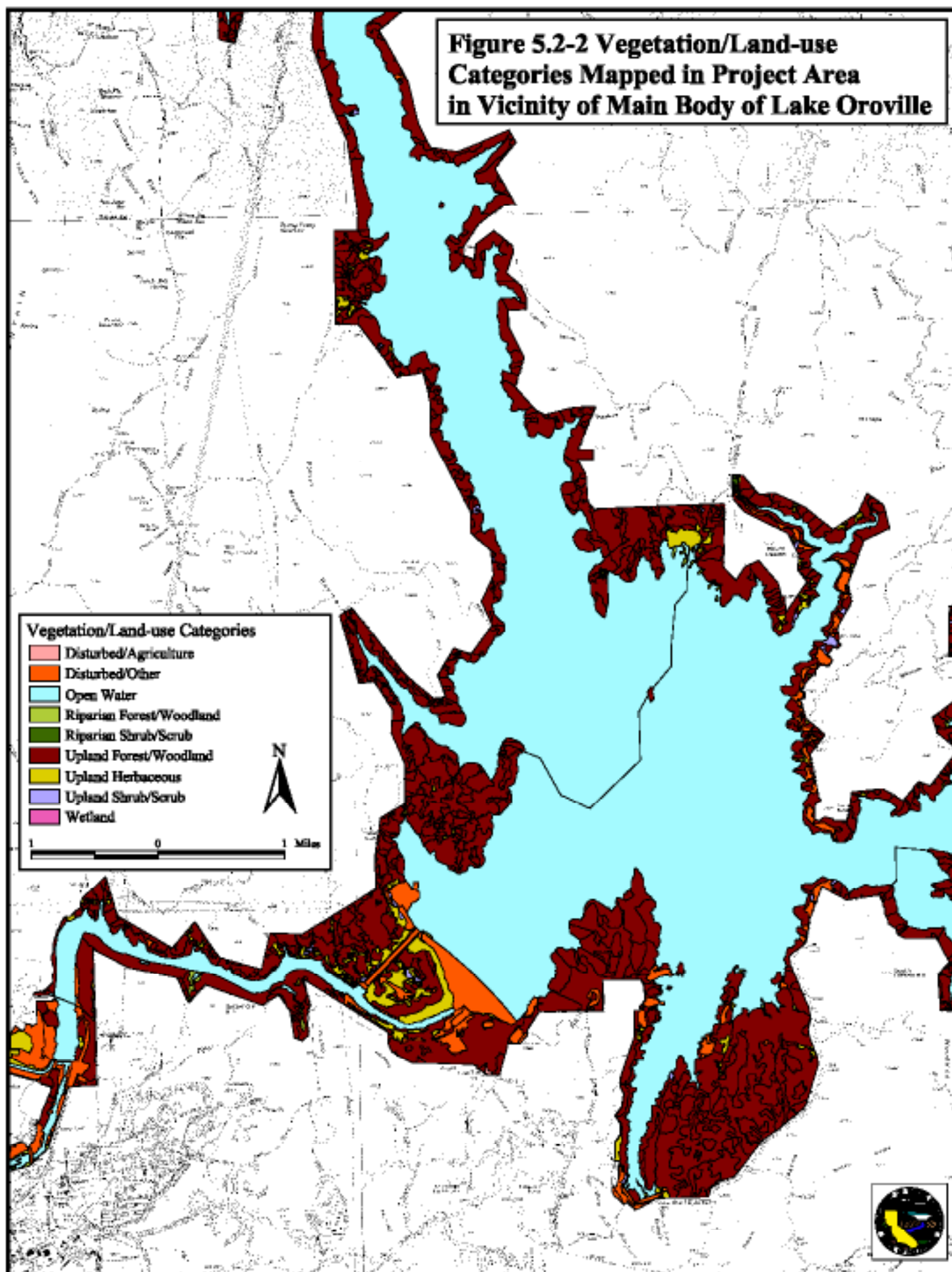


Figure 5.2-3 Vegetation/Land-use Categories Mapped in Project Area in Vicinity of Middle and South Fork Feather Rivers in Lake Oroville

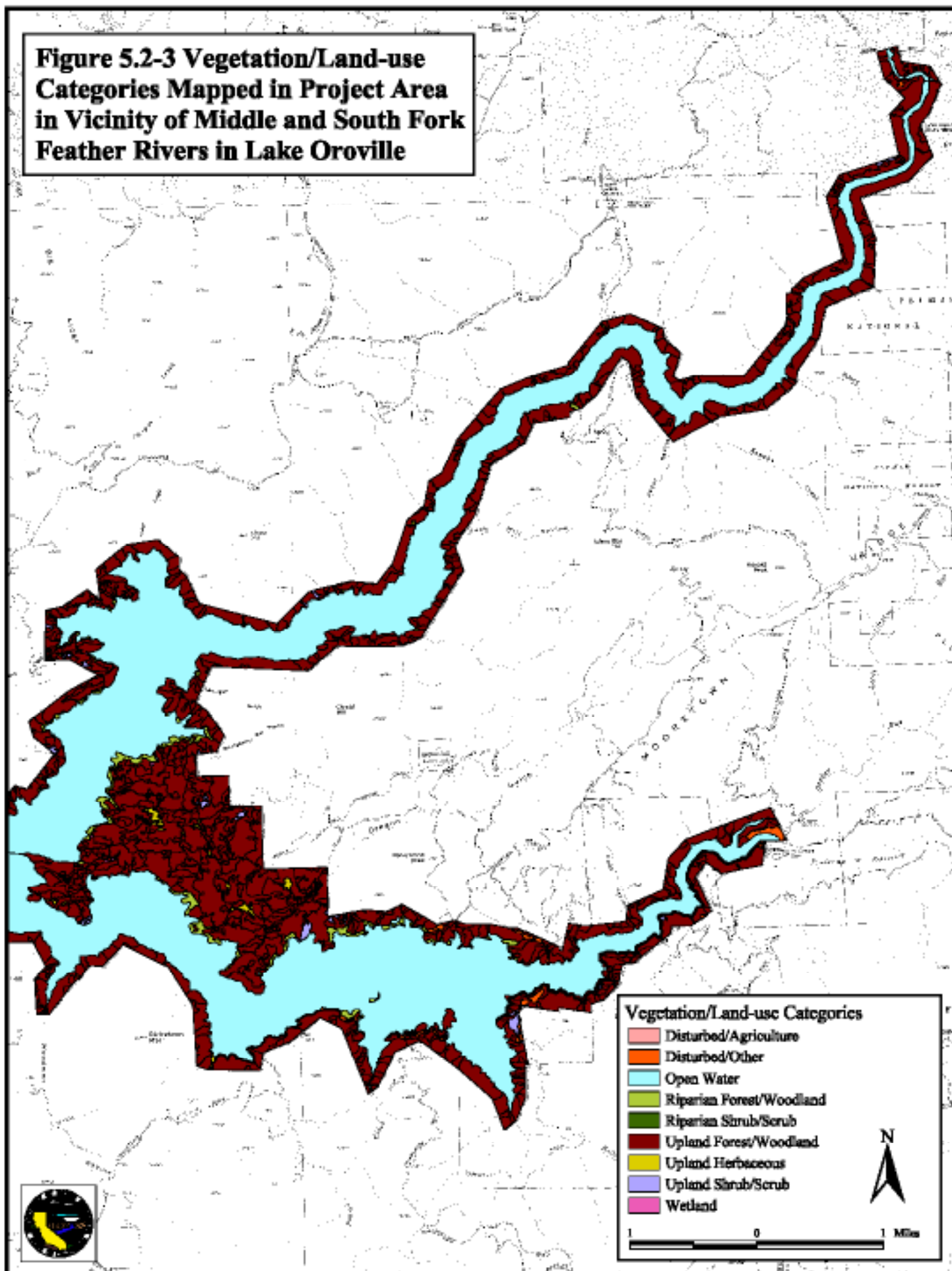


Figure 5.2-4 Vegetation/Land-use Categories Mapped in Project Area in Vicinity of West Branch and North Forks Feather River in Lake Oroville

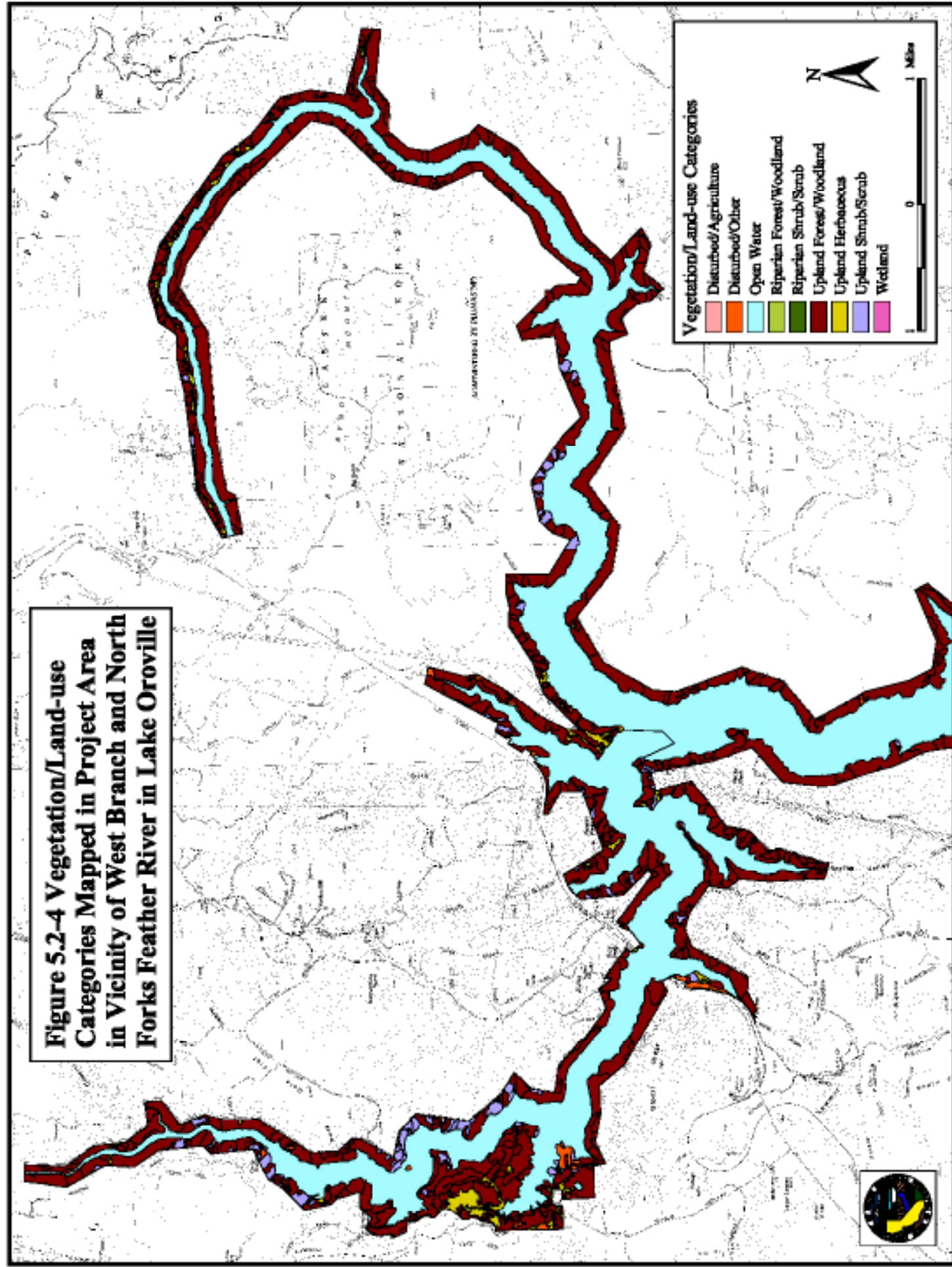


Figure 5.2-5 Example of Vegetation Associations
Mapped Around Lake Oroville



Vegetation Associations-Foreman Creek



400 0 400 800 Feet



Figure 5.2-6 Example of Vegetation Associations
Mapped in the Thermalito Complex

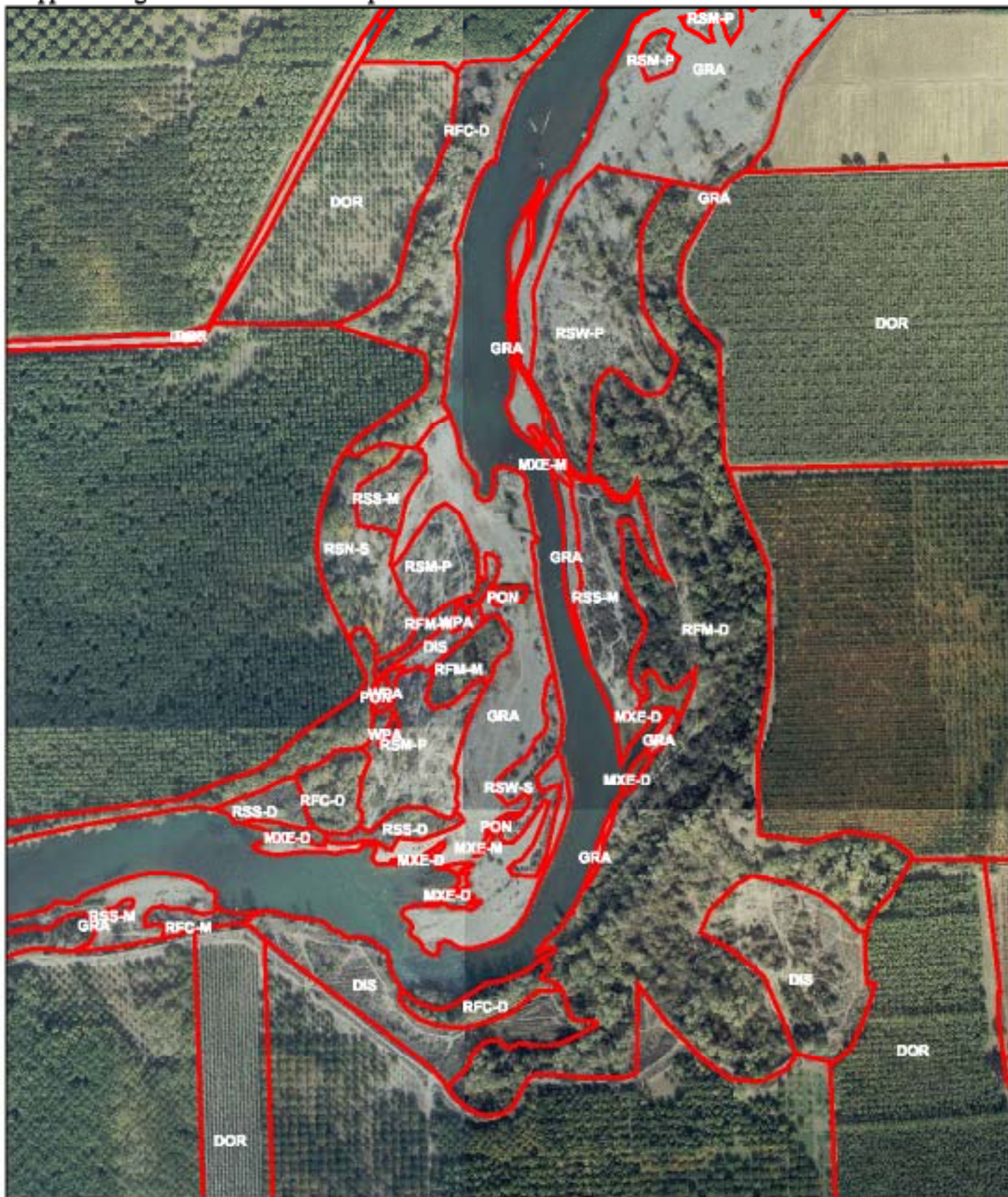


Vegetation Associations-Thermalito Afterbay

400 0 400 800 Feet



Figure 5.2-7 Example of Vegetation Associations
Mapped Along the Feather River Floodplain



Vegetation Associations-Feather River



400 0 400 800 Feet



5.3 TASK 6/TASK7 – CALIFORNIA HABITAT RELATIONSHIPS AND RESULTING DATA

The vegetation associations mapped under Task 3 were used to produce the WHR mapped units. Based on the crosswalk categories provided by Parisi (1998), the vegetation communities were converted to WHR categories. WHR habitats and habitat stages are based on the major habitat divisions (tree, shrub, herbaceous, aquatic, and developed). These divisions are further categorized into WHR habitat types and are presented in Table 5.3-1. This information was extracted from *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988). The crosswalk of the WHR habitat stages for the study area is presented in Table 5.3-2.

Table 5.3-1. Available WHR habitat stages for tree, shrub, herbaceous, and aquatic habitats.

Tree dominated habitats				
Standards for Tree Size		Standards for Canopy Closure		
Size Class	DBH	WHR Code	Closure Class	Percent Cover
1	<1"	S	Sparse	10 – 24%
2	1" – 6"	P	Open	25 – 39%
3	6" – 11"	M	Moderate	40 – 59%
4	11"-24"	D	Dense	60 – 100%
5	>24"			
6	Size class 5 over layer of class 4 & 3 trees			
Shrub dominated habitats				
Standards for Shrub Size		Standards for Canopy Closure		
Size Class	Crown Decadence	WHR Code	Closure Class	Percent Cover
1	Seedlings <3 yrs	S	Sparse	10 – 24%
2	Young – no decadence	P	Open	25 – 39%
3	Mature 1 – 25% decadence	M	Moderate	40 – 59%
4	Decadent >25%	D	Dense	60 – 100%
Herbaceous Habitats				
Standards for height classes		Standards for Canopy Closure		
Height Class	Plant Height	WHR Code	Closure Class	Percent Cover
1	<12"	S	Sparse	2 – 9%
2	>12"	P	Open	10 – 39%
		M	Moderate	40 – 59%
		D	Dense	60 – 100%

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Aquatic Habitats				
Aquatic Zones		Aquatic Substrates		
Aquatic Zone	Standard	Code	Substrate	Standard
1	Open water, not closely associated with shoreline	O	Organic	Organic material
2	Submerged, substrate continually submerged	M	Mud	Wet, soft earth
3	Periodically flooded, substrate flooded from time to time	S	Sand	Coarse mineral sediment (.003-.08 inch)
4	Shore, substrate continually exposed and not occupied by vegetation	G	Gravel/Cobble	Rock fragments (.08-3.0 inch)
		R	Rubble/Boulders	Rock fragments >3.0 inch covers at least 75% of surface
		B	Bedrock	Bedrock covers at least 75% of surface

Table 5.3-2 Crosswalk between vegetation cover/associations and WHR habitat type with codes

Vegetation Cover		VegCode	WHR Type	WHR Code
Aquatic/Submerged				
	Algae	ALA	Lacustrine/Riverine	LAC-20/RIV20
	Mixed aquatic	MAA	Lacustrine/Riverine	LAC-20/RIV20
	Mosquito fern	MFA	Lacustrine/Riverine	LAC-20
	Water-primrose	WPA	Lacustrine/Riverine	LAC-20/RIV20
	Water-meal	WMA	Lacustrine/Riverine	LAC-20/RIV20
Disturbed/Agriculture				
	Eucalyptus	EUC	Eucalyptus	EUC
	Fallow field	FAL	Deciduous Orchard	DOR -1S
	Hayfield	HAY	Irrigated Hayfield	IRH
	Orchard			
	Deciduous	DOR	Deciduous Orchard	DOR
	Evergreen	EOR	Evergreen Orchard	EOR
	Pasture	PAS	Irrigated Hayfield	IRH
	Plantation	PLT	Ponderosa Pine	PPN
	Rice	RIC	Rice	RIC
	Row crops			
	Dryland	DGR	Dryland Grain & Seed Crops	DGR
	Irrigated	IRF	Irrigated Row & Field Crops	IRF
	Vineyard	VIN	Vineyard	VIN
Disturbed/Other				
	Disturbed	DIS	Barren	BAR

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Vegetation Cover		VegCode	WHR Type	WHR Code
	Gravel tailings	GRT	Barren	BAR
	Gravel/sandbar	GRA	Riverine	R-3S/R3G
	Rock outcrop			
	Other	ROC-O	Barren	BAR
	Serpentine	ROC-S	Barren	BAR-S
	Volcanic	ROC-V	Barren	BAR
	Urban			
	Residential	URB-S	Urban	URB-S
	Rural/ranch	URB-R	Urban	URB-R
	Urban/disturbed	URB-U	Urban	URB-U
Open Water				
	Canal	CAN	Riverine	RIV-3M
	Lake	LAK	Lacustrine	LAC
	Pond	PON	Lacustrine	LAC-2G,LAC-3M
	Riverine	RIV	Riverine	RIV-3M
Riparian Forest/Woodland				
	Black willow riparian forest	RFB	Valley Foothill Riparian	VRI
	Black willow/blackberry scrub	RWB	Valley Foothill Riparian	VRI
	Black willow /white alder riparian forest	RWA	Valley Foothill Riparian	VRI
	Cottonwood/black willow riparian forest	RCW	Valley Foothill Riparian	VRI
	Disturbed riparian forest	RFD	Valley Foothill Riparian	VRI
	Foothill/montane mixed riparian forest	RFF	Valley Foothill Riparian	VRI
	Fremont cottonwood riparian forest	RFC	Valley Foothill Riparian	VRI
	Mixed willow riparian forest	RFW	Valley Foothill Riparian	VRI
	Non-native riparian forest	RFN	Valley Foothill Riparian	VRI
	Valley mixed riparian forest	RFM	Valley Foothill Riparian	VRI
	Valley oak riparian forest	RFV	Valley Foothill Riparian	VRI
Riparian Shrub/Scrub				
	Arundo scrub	RSA	Valley Foothill Riparian	VRI
	Blackberry scrub	RSB	Valley Foothill Riparian	VRI
	Blackberry/willow scrub	RSX	Valley Foothill Riparian	VRI
	Elderberry riparian scrub	RSE	Valley Foothill Riparian	VRI
	Mixed riparian scrub	RSM	Valley Foothill Riparian	VRI

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Vegetation Cover	VegCode	WHR Type	WHR Code
Mixed willow scrub	RSW	Valley Foothill Riparian	VRI
Sandbar willow scrub	RSS	Valley Foothill Riparian	VRI
Non-native riparian scrub	RSN	Valley Foothill Riparian	VRI
Upland Forest/Woodland			
Black oak woodland	BLO	Montane Hardwood	MHW
Blue oak woodland	BOW	Blue Oak Woodland	BOW
Blue oak woodland/mixed chaparral	BOC	Blue Oak Woodland	BOW
Blue oak/foothill pine woodland	BFW	Blue Oak - Digger Pine	BOP
Blue oak-foothill pine woodland/chaparral	BFC	Blue Oak - Digger Pine	BOP
Canyon live oak woodland	CLO	Montane Hardwood	MHW
Douglas fir forest	DFF	Douglas Fir	DFR
Foothill pine woodland-chaparral	FPC	Blue Oak - Digger Pine	BOP
Foothill pine-mixed oak woodland	FPO	Blue Oak - Digger Pine	BOP
Foothill pine-mixed oak woodland- chaparral	FOC	Blue Oak - Digger Pine	BOP
Mixed conifer forest	MCF	Sierran Mixed Conifer	SMC
Mixed conifer hardwood forest	MCH	Montane Hardwood- Conifer	MHC
Mixed oak woodland	MOW	Montane Hardwood	MHW
Mixed oak woodland-chaparral	MOC	Montane Hardwood	MHW
Mixed pine-mixed oak woodland	MPO	Montane Hardwood- Conifer	MHC
Mixed pine-mixed oak woodland- chaparral	POC	Montane Hardwood- Conifer	MHC
Mixed pine woodland-chaparral	MPC	Blue Oak - Digger Pine	BOP
Ponderosa pine-douglas fir forest	PDF	Sierran Mixed Conifer	SMC
Ponderosa pine forest	PPF	Ponderosa Pine	PPN
Ponderosa pine-mixed oak woodland	PMO	Montane Hardwood- Conifer	MHC
Ponderosa pine-mixed oak woodland/chaparral	PMC	Montane Hardwood- Conifer	MHC
Valley oak woodland	VOW	Valley Oak Woodland	VOW
Upland Herbaceous			
California annual grassland	AGS	Annual Grassland	AGS
Disturbed grassland	DGS	Annual Grassland	AGS
Short forbland	SFB	Annual Grassland	AGS
Tall forbland	TFB	Annual Grassland	AGS
Upland Shrub/Scrub			
Mixed chaparral	MXC	Mixed Chaparral	MCH
Whiteleaf manzanita chaparral	MAN	Mixed Chaparral	MCH
Wetland			

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Vegetation Cover		VegCode	WHR Type	WHR Code
	Bulrush	BEW	Freshwater Emergent Wetland	FEW
	Bulrush/cattail	BCW	Freshwater Emergent Wetland	FEW
	Cattail	CEW	Freshwater Emergent Wetland	FEW
	Mixed emergent vegetation	MXE	Freshwater Emergent Wetland	FEW
	Rush	REW	Freshwater Emergent Wetland	FEW
	Rush/verbena	RVW	Freshwater Emergent Wetland	FEW
	Seep/wet area	WET	Freshwater Emergent Wetland	FEW
	Verbena	VEW	Freshwater Emergent Wetland	FEW

The number of acres that occur within each of the habitat stage for the Project Area, one-mile buffer and downstream Feather River floodplain is presented in Table 5.3-3.

Table 5.3-3. Acreages of WHR habitat types found within the study area.

Habitat Type/WHR		Habitat Stage	Acreage			WHR Code
			Project Area	One-Mile Buffer	Feather R Floodplain	
Agriculture						
	Dryland Grain and Seed Crops - DGR		98.3	6.63		DGR
	Deciduous Orchard - DOR	1S	4.2	263.93	700.37	DOR-1S
		2D	0.3	914.31	288.22	DOR-2D
		2M	7.4	223.22	502.54	DOR-2M
		2P	3.0	953.43	1128.90	DOR-2P
		2S	9.6	370.26	2075.67	DOR-2S
		3D	0.4	838.77	1740.09	DOR-3D
		3M	3.8	62.32	1161.21	DOR-3M
		3P		22.11	117.11	DOR-3P
		3S			11.35	DOR-3S
		4D			2980.00	DOR-4D
		4M			274.75	DOR-4M
		4P			28.11	DOR-4P
		4S			3.85	DOR-4S
		5D			83.52	DOR-5D
		5M			66.78	DOR-5M

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	Habitat Type/WHR	Habitat Stage	Acreage			WHR Code
			Project Area	One-Mile Buffer	Feather R Floodplain	
	Evergreen Orchard - EOR	1S		3.26		EOR-1S
		2D	0.4			EOR-2D
		2M		131.24		EOR-2M
		2P	4.6	37.98		EOR-2P
		2S		59.18		EOR-2S
		3D	2.7	53.69	5.76	EOR-3D
		3M		69.14	14.03	EOR-3M
		3P		7.38		EOR-3P
		3S		5.57		EOR-3S
	Eucalyptus - EUC	2D		3.98		EUC-2P
		2P		1.14		EUC-2P
		3D		48.54	4.97	EUC-3D
		3M	0.5	1.64		EUC-3M
		3P		2.34		EUC-3P
		3S	0.6			EUC-3S
		4D	1.5	6.79		EUC-4D
		4M		3.04		EUC-4M
	Irrigated Hayfield - IRH		6.2	443.78	346.86	IRH
	Irrigated Row and Field Crops - IRF			259.95	223.47	IRF
	Pasture - PAS		0.9	253.06	.04	IRH
	Rice - RIC		6.9	4369.76	4414.10	RIC
	Vineyard - VIN		0.8	45.24	2.2	VIN
	Aquatic Types					
	Lacustrine - LAC	1G	0.8	131.44		LAC-1G
		1M	3681.8	13.45		LAC-1M
		1R	15148.0	49.56		LAC-1R
		2G	296.6	108.45	87.39	LAC-2G
		2O	443.2	33.33	24.26	LAC-2O
		2R	260.8			LAC-2R
		3M	23.3	81.68	186.95	LAC-3M
	Riverine - RIV	1G			182.47	RIV-1G
		1R	310.8	315.23	592.57	RIV-1R
		1S			2010.85	RIV-1S
		2B	1.3	10.97		RIV-2B
		2M			8.30	RIV-2M
		2O			65.63	RIV-2O
		3B	15.7	0.07		RIV-3B
		3G	67.8	115.22	103.14	RIV-3G

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	Habitat Type/WHR	Habitat Stage	Acreage			WHR Code
			Project Area	One-Mile Buffer	Feather R Floodplain	
		3M	87.0	55.83	82.02	RIV-3M
		3S			417.42	RIV-3S
	Disturbed					
	Urban - URB	URB-R	52.5	1921.08	60.75	URB-R
		URB-S	47.4	3973.31	46.61	URB-S
		URB-U	791.1	3499.20	2273.84	URB-U
	Barren - BAR		1379.5	1811.29	182.21	BAR
	Herbaceous Habitat					
	Annual Grassland - AGS	1D	17.8	4.39	1391.72	AGS-1D
		1M	42.0	31.70	375.55	AGS-1M
		1P	4.2	9.48	17.82	AGS-1P
		2D	2258.5	10644.34	208.03	AGS-2D
		2M	277.7	1458.09	644.74	AGS-2M
		2P	150.9	68.10	23.52	AGS-2P
	Freshwater Emergent Wetland - FEW	1M		0.51		FEW-1M
		2D	468.3	232.86	170.33	FEW-2D
		2M	426.5	97.31	35.46	FEW-2M
		2P	22.7	16.78	4.30	FEW-2P
	Shrub Habitat					
	Mixed chaparral - MCH	3D	146.6	1801.23		MCH-3D
		3M	28.0	192.13		MCH-3M
		3P	31.4	97.28		MCH-3P
		3S	23.2	195.20		MCH-3S
	Tree Habitat					
	Blue Oak-Digger Pine - BOP	3D	2190.6	4927.99		BOP-3D
		3M	991.1	3970.27		BOP-3M
		3P	303.9	1412.41	1.09	BOP-3P
		3S	53.1	377.17	1.00	BOP-3S
		4D	1.9	73.97	.84	BOP-4D
		4M	3.0	71.73	1.35	BOP-4M
		4P	0.9	4.89		BOP-4P
		4S	10.6	20.45		BOP-4S
	Blue Oak Woodland - BOW	3D	46.4	33.70		BOW-3D
		3M	147.6	352.91		BOW-3M
		3P	54.9	400.47		BOW-3P
		3S	29.7	417.81		BOW-3S

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	Habitat Type/WHR	Habitat Stage	Acreage			WHR Code
			Project Area	One-Mile Buffer	Feather R Floodplain	
		4D	104.6	282.80	0.52	BOW-4D
		4M	222.9	1926.89		BOW-4M
		4P	154.0	1056.15		BOW-4P
		4S	35.4	192.92		BOW-4S
		5P		4.52		
		5S		5.05		
	Douglas Fir - DFR	4D	158.0	2578.67		DFR-4D
	Montane Hardwood-Conifer - MHC	3D		4342.31		
		3M	429.1	6014.11		MHC-3M
		3P	40.3	658.40		MHC-3P
		3S	4.1	92.42		MHC-3S
		4D	1725.6	9512.75		MHC-4D
		6D	439.6	1601.61		MHC-6D
		6M	239.5	1440.63		MHC-6M
		6P	282.5	2035.99		MHC-6P
		6S	15.3	286.58		MHC-6S
	Montane Hardwood - MHW	3D	2461.5	7594.71		MHW-3D
		3M	616.1	4157.65		MHW-3M
		3P	164.6	1641.03		MHW-3P
		3S	24.4	382.73		MHW-3S
	Montane Riparian - MRI	1D	0.1	3.97		MRI-1D
		1M	1.4	11.30		MRI-1M
		1P	2.7	9.77		MRI-1P
		3D	13.2	371.79		MRI-3D
		3M	11.5	53.68		MRI-3M
		3P	26.0	20.03		MRI-3P
	Ponderosa Pine - PPN	2M		601.64		
		4D	3.0	563.57		PPN-4D
		4M		28.72		
	Sierran Mixed Conifer - SMC	4D	109.0	3439.41		SMC-4D
		4M	1.7	46.10		SMC-4M
		4P		46.69		

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Oroville Facilities Relicensing Team

June 23, 2003

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	Habitat Type/WHR	Habitat Stage	Acreage			WHR Code
			Project Area	One-Mile Buffer	Feather R Floodplain	
	Valley Oak Woodland - VOW	2S	4.1			VOW-2S
		3M		1.34		VOW-3M
		3P			12.16	VOW-3P
		4D		2.49	14.56	VOW-4D
		4M		7.06	3.94	VOW-4M
		4P	4.1	7.27	13.45	VOW-4P
		4S		24.02		VOW-4S
		5D		90.10	9.99	VOW-5D
		5P	4.9	19.34	5.44	VOW-5P
	Valley Foothill Riparian - VRI	1D	11.2	40.43	31.10	VRI-1D
		1M	3.5	14.42	19.86	VRI-1M
		1P	0.3	5.60		VRI-1P
		2D	18.4	45.91	418.48	VRI-2D
		2M	90.2	74.86	475.24	VRI-2M
		2P	252.6	35.95	565.79	VRI-2P
		2S	127.2	81.51	395.93	VRI-2S
		3D	52.0	87.67	277.64	VRI-3D
		3M	158.0	93.94	211.94	VRI-3M
		3P	123.9	56.62	267.38	VRI-3P
		3S	155.4	21.51	419.79	VRI-3S
		4D	861.4	121.32	1740.07	VRI-4D
		4M	785.6	160.86	718.70	VRI-4M
		4P	675.1	12.73	232.76	VRI-4P
		4S	80.3	4.78	78.16	VRI-4S
		5D			436.92	VRI-5D
		5M			70.30	VRI-5M
		5P			1.61	VRI-5P
		6D			82.38	VRI-6D
	Unknown			13.33		

As with the vegetation mapping, the size of the study area and the complexity of the WHR categories make it impossible to depict the entire WHR mapping product in this report. Maps and/or the resulting GIS layers will be available upon request. Figures 5.3-1, 5.3-2, and 5.3-3 depict a small sample of the WHR mapping within the Project Area and the Feather River floodplain. The areas depicted in these figures are the same as those chosen for the vegetation association maps (Figures 5.2-5, 5.2-6, and 5.2-7).

Figure 5.3-1 Example of WHR Habitat
Mapped Around Lake Oroville



WHR Habitats-Foreman Creek



400 0 400 800 Feet



Figure 5.3-2 Example of WHR Habitats
Mapped in the Thermalito Complex



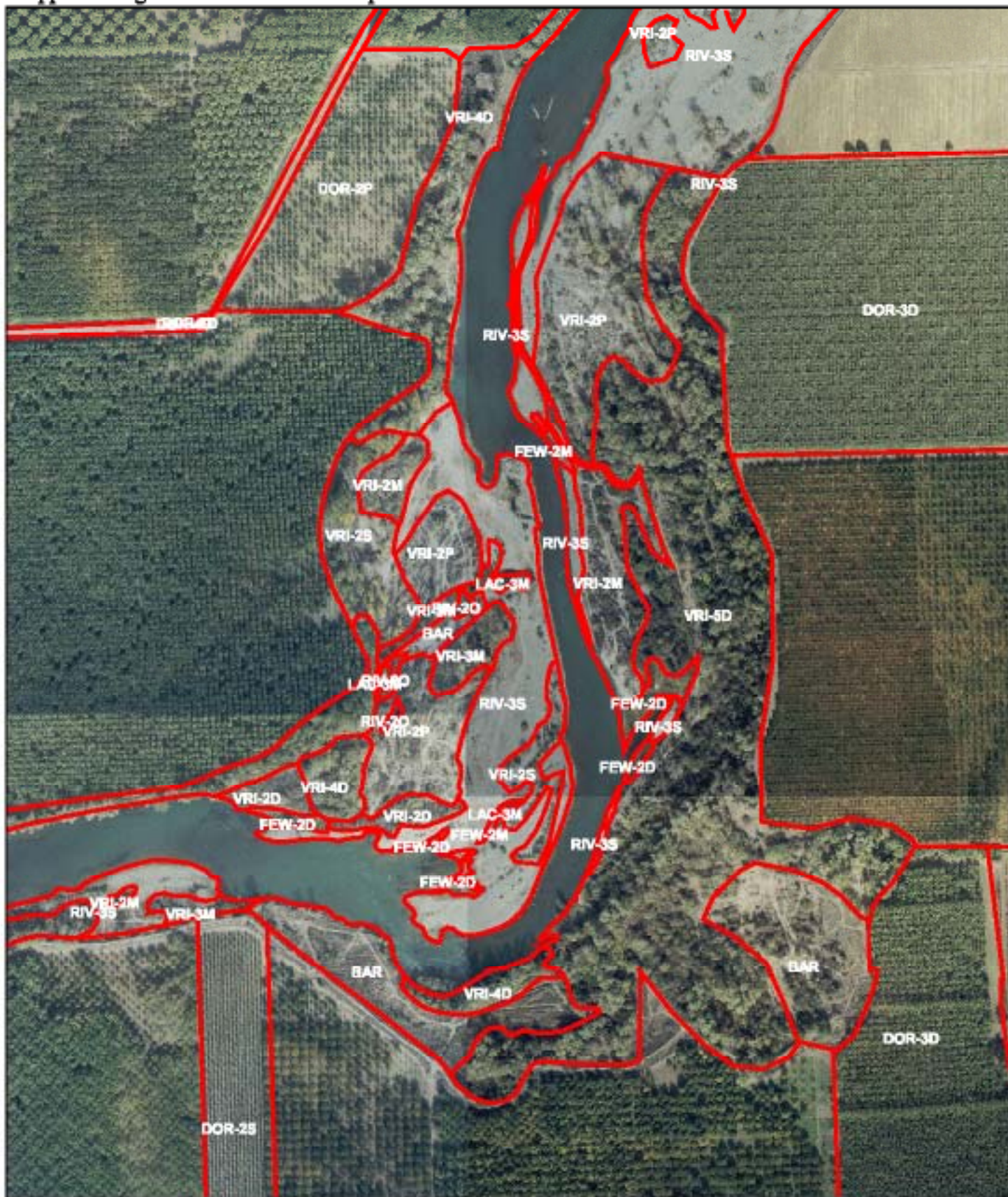
WHR Habitats-Thermalito Afterbay



400 0 400 800 Feet



Figure 5.3-3 Example of WHR Habitats
Mapped Along the Feather River Floodplain



WHR Habitats-Feather River



400 0 400 800 Feet



6.0 ANALYSES

The analysis of project effects has not been completed.

7.0 REFERENCES

California Department of Fish and Game 1998. Vegetation Mapping of Anza-Borrego Desert State Park and Environs. A Report to the California Department of Parks and Recreation, Sacramento.

California Department of Fish and Game 2000. Vegetation Mapping of Suisun Marsh, Solano County. A Report to the California Department of Water Resources, Sacramento.

Castro, B. 2003. DWR Northern District Metadata(for Oroville Relicensing vegetation and WHR habitat mapping around Lake Oroville. Red Bluff

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Unpublished document, California Department of Fish and Game Natural Heritage Division, Sacramento.

Mayer, K.E., and W.F. Laudenslayer Jr., eds. 1988. A guide to wildlife habitats in California. California Department of Forestry. Sacramento.

NOAA - National Oceanic Atmospheric Administration. NOAA's Biogeography Program. Habitat Digitizer Extension. Site assessed 2001.

Parisi, M. 2001. CWHR Wildlife Habitats crosswalked with CNPS Vegetation Series. Unpublished manuscript. California Department of Fish and Game. Sacramento.

Sawyer, John and Todd Keeler-Wolf, 1995. A Manual of California Vegetation. California Native Plant Society Press. 469 p.

APPENDICES

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Appendix A

Descriptions of Vegetation/Land-Use Associations

UPLAND FOREST/WOODLANDS

MCF - Mixed conifer forest. Canopy dominated by more conifers than hardwoods, usually in moderate to dense stands on higher-elevation northerly slopes, ridges and canyons. Typical tree species include ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), White fir (*Abies concolor*), Incense cedar (*Calocedrus decurrens*), black oak (*Quercus kelloggii*), tanoak (*Lithocarpus densiflora*), mtn dogwood (*Cornus nuttallii*) and madrone (*Arbutus menziesii*); shrub and herb layers are patchy, in openings and at edges.

PDF – Ponderosa pine-Douglas fir forest. Canopy dominated by ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) in varying but roughly equal proportions, occupying north-facing slopes, some ridges, and deeper canyons. May include occasional madrone, canyon live oak, or black oak and minor to no herb or shrub layer except around edges.

MCH - Mixed conifer-hardwood forest. Canopy dominated by approximately equal proportions of conifers and hardwoods, usually in very dense stands on northerly slopes and deep into river canyons. Typical tree species include ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), black oak (*Quercus kelloggii*), canyon live oak (*Q. chrysolepis*), tanoak (*Lithocarpus densiflora*) and madrone (*Arbutus menziesii*). Shrub and herb layers are minor or scattered at edges.

CLO – Canyon live oak woodland. Canyon live oak (*Q. chrysolepis*) the sole or heavily dominant tree species, with occasional black oaks or single conifers, occupying north-facing steep canyon slopes. Shrub and herb layers are minor or absent except at edges.

BOW – Blue oak woodland. Blue oak (*Quercus douglasii*) the only or dominant tree species; includes occasional foothill pines, Interior live oaks, scattered shrubs; often patchy with a grassy understory. Varies from large oaks in open savanna in valleys to very small, stunted oaks on thin-soiled slopes. Intergrades with almost every other vegetation type, occupying mostly flat to warmer exposures in lower to mid foothills.

BOC – Blue oak woodland/chaparral. Blue oak (*Quercus douglasii*) woodland with a substantial understory of mixed chaparral shrub species or chaparral dominated by whiteleaf manzanita (*Arctostaphylos viscida*); often has scattered foothill pine and/or Interior live oak. Varies from extremely dense (the chaparral forming a continuous

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carpet) to sparse on very thin-soiled or rocky slopes; usually occupies south-facing slopes at lower elevations.

BFW - Blue oak-foothill pine woodland. Blue oak (*Quercus douglasii*) the dominant tree, but with substantial component of foothill pine (*Pinus sabiniana*) present in tree layer, usually as a sparse to moderately dense canopy. Usually forms a very patchy mosaic in lower to mid foothills on ridgelines and various warm exposures with grassland and chaparral species, but shrub component is minor.

BFC – Blue oak-foothill pine woodland/chaparral. Same as BFW but with a substantial chaparral understory of mixed shrub species or dominated by whiteleaf manzanita (see MAN for representative chaparral species),

MOW - Mixed oak woodland. Mixture of oak species, usually in a moderate to dense canopy, with occasional foothill or ponderosa pines. Species consist mainly of Interior live oak (*Quercus wislizenii*), with either Canyon live oak (*Q. chrysolepis*) and/or blue oak (*Q. douglasii*). Canopy can include scattered Buckeye (*Aesculus californica*), California bay (*Umbellularia californica*), black oak (*Q. kelloggii*) on cooler or higher slopes, and chaparral shrubs at edges. Occupies cooler and canyon-side slopes in mid to upper foothills.

FPO - Foothill pine-mixed oak woodland. . Usually a sparse to moderately dense overstory of foothill pine (*Pinus sabiniana*) over an often dense canopy of mixed live oaks (mostly Interior live oak (*Quercus wislizenii*), but occasionally includes blue oak), with only a very minor mixed chaparral shrub or whiteleaf-manzanita component. Can be open to quite dense. Mid-foothill elevations, on various warm exposures.

FOC – Foothill pine-mixed oak woodland/chaparral. Same as FPO, with a substantial mixed chaparral shrub or whiteleaf-manzanita component; small live oaks often completely mixed into the shrub layer. Often quite dense, due to continuous chaparral carpet. Mid foothill elevations, on various warm exposures.

FPC – Foothill pine woodland/mixed chaparral. Same as FOC but with no oaks, or minor component of small Interior live oaks scattered within the chaparral; the foothill pine overstory is usually sparse to open. Chaparral often a pure stand of whiteleaf manzanita (*Arctostaphylos viscida*). Lower to mid foothills, on ridges, thin soil, steep warm exposures.

UPLAND SHRUB/SCRUB

MAN - Whiteleaf manzanita chaparral. Usually almost pure *Arctostaphylos viscida*, sometimes includes *A. manzanita* or *A. mewukka*; can be patchy with occasional foothill pine, Interior live oak, other shrub species, or grassy areas. Occupies south-facing and thin-soiled or rocky slopes at lower elevations.

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MXC – Mixed chaparral. Mixed shrub species (no one species clearly dominant) include whiteleaf manzanita (*Arctostaphylos viscida*), toyon (*Heteromeles arbutifolia*), coffeeberry (*Rhamnus tomentella*), buckbrush (*Ceanothus cuneatus*) and others. Can be patchy with grassy areas or occasional tree species, on various exposures in lower to mid foothills.

RIPARIAN FOREST/WOODLANDS

RFF – Foothill/montane mixed riparian forest. Usually very narrow, but sometimes dense, strips of woody species dependent upon perennial water supply immediately along streamcourses. No one species dominates; tree species include Fremont's cottonwood (*Populus fremontii*), alder (*Alnus rhombifolia*), willow (*Salix*) and sometimes sycamore (*Platanus racemosa*) in the valley edges and lower foothills; Bigleaf maple (*Acer macrophyllum*) and sometimes mtn. Dogwood (*Cornus nuttallii*) are added at mid elevations in cooler canyons. Typical associates include wild grape (*Vitis californica*), spicebush (*Calycanthus occidentalis*) and several fern species. Present at all elevations and all exposures, especially cooler canyons, often hidden within other wooded vegetation.

RFW – Mixed willow riparian forest. Open stands of mature willow trees (*Salix goodingii*, *S. laevigata*), with occasional Fremont cottonwood (*Populus fremontii*) individuals, usually single trees or groups of 2 to 3 around edges of Lake Oroville or occasionally along river edges in upper lake arms.

RIPARIAN SHRUB/SCRUB

RSM - Mixed riparian scrub. Mixed shrub species dependent upon perennial water supply immediately along streamcourses; includes no or very few mature trees, but may include tree seedlings. Shrub species include willows (*Salix* spp.), mulefat (*Baccharis salicifolia*), shrubby dogwoods (*Cornus glabrata*, *C. sessilis*), Mexican elderberry (*Sambucus mexicana*), Oregon ash (*Fraxinus latifolia*) as well as numerous native perennial and annual herbs.

RSW - Mixed willow scrub. Mixed shrubby willow species, immediately along streamcourses, including sandbar willow (*Salix exigua*), arroyo willow (*S. lasiolepis*), red willow (*S. laevigata*), yellow willow (*S. lucida* ssp. *lasiandra*) and occasional other riparian shrub species, usually in dense stands but sometimes sparse and interrupted. Usually occurs in small valley bottoms or near seeps or springs.

UPLAND HERBACEOUS

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AGS – Annual grassland. A mixture of mostly non-native, introduced annual grasses such as oats, bromes, fescues and vulpias; includes native and non -native herbaceous annuals as well as numerous native perennial species growing from bulbs, rhizomes, and other underground parts. Occupies valley floors, patches within oak and other woodlands, at lower elevations, valley edges and into lower foothills on warmer exposures.

WETLAND

MXE – Mixed emergent vegetation. Usually dense stands of cattails (*Typha* spp), rushes (*Juncus* spp), sedges (*Carex* spp.) and other grasslike species (e.g. *Eleocharis* spp.) around pond or other open water edges, rooted in bottom muds and emerging above standing water. Sometimes used if unable to determine species composition.

WET – Seep/wet area. Usually localized, small dense stands of mixed perennial herbs, grasses and wetland species such as sedges or small rushes, and occasionally low shrubs, in low-lying areas within grasslands, usually along a drainage swale but sometimes a seepy area on a slope; usually no standing water.

DISTURBED/OTHER

DIS – Disturbed. Areas with little to no vegetation; usually obviously graded or cleared but with no urban structures.

GRT - Gravel tailings. Large area of tailing occur in the Project area, mostly in the OWA. Cobble to boulder size rock with little to no vegetation.

GRA - Gravel/sandbar. Areas with cobble, gravel, or sand sized substrates. Usually associated with the edges of the stream channel. Size of substrate tends to get smaller (sand) as you go downstream along the Feather River.

ROC-S – Rock outcrop-Serpentine. Sparsely vegetated to bare rocky area in aerial photos that is within or immediately adjacent to serpentine as mapped on geological map; usually has thinly scattered native annual and perennial grasses and herbs, occasional shrubs (e.g. *Quercus durata*, mixed chaparral species) and sometimes small foothill pines (*Pinus sabiniana*). The Serpentine edaphic association (Clifton 2001) can include several rare plant species, such as *Fritillaria eastwoodiae*, *Senecio eurycephalus* var. *lewisrosei*, *Calycadenia oppositifolia*, *Cardamine* spp. , and *Allium jepsonii*.

ROC-V – Rock outcrop-Volcanic. Sparsely vegetated to bare rocky area in aerial photos that is within or immediately adjacent to volcanic areas as mapped on geological map; usually basalt but sometimes Tuscan mudflow. Usually has very thinly scattered

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native annual and perennial grasses and herbs, often mixed with non-native grasses where adjacent to annual grassland.

ROC-O – Rock outcrop-Other. Sparsely vegetated to bare rocky area in aerial photos that is not within or immediately adjacent to serpentine or volcanic areas as mapped on geological map; often metamorphic or metasedimentary, or unknown origin. Usually has very thinly scattered native annual and perennial grasses and herbs, often mixed with non-native grasses where adjacent to annual grassland.

URB-U - Urban/disturbed. Areas most heavily disturbed with a higher percentage of buildings and paved ground cover. Usually very little planted vegetation, consisting mostly of non-native horticultural varieties.

URB-S - Residential. Areas along the outsides of the urban area, usually with a higher percentage of vegetation.

URB-R - Rural/Ranch. Large isolated parcels of land, with residential or farm buildings. Usually surrounded by agricultural fields or grasslands.

DISTURBED/AGRICULTURE

EUC _ Eucalyptus. Plantings of *Eucalyptus* sp. Usually found around houses, some plantations along Hwy. 70. Mostly out of the Project Area,

FAL – Fallow field. Fields that were obviously under recent agricultural practice. Most surrounded by walnut orchards, but were not planted at the time the photos were taken. This could vary from year to year so were given a your orchard stage for WHR.

Hay – Hayfield. Includes grass hayfield that are planted with non-native grass species, irrigated, and mowed.

ORC – Orchards. Includes both deciduous and evergreen orchards. Deciduous species include walnuts (most common), some prunes, and peaches. Evergreen species include olives and citrus varieties.

PAS – Pasture. Fields usually associated with rural/ranch sites. Areas most likely have some irrigation and are grazed, but don't appear to be mowed regularly.

RIC – Rice. A major cropland plant near the Afterbay. Occurs in the Feather River floodplain in the Sutter Bypass.

DGR/IRH – Row Crops. Includes both dryland and irrigated crops. Some dryland row crops are found with the Project Area around the Afterbay. These are mostly planted

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for waterfowl feed. Both types also occur in the Feather River floodplain, usually associated with orchards or rural/ranch sites.

PLT – Plantation. Young to medium-aged ponderosa pine (*Pinus ponderosa*) in regular planted rows in previously clear-cut site; usually in surrounding Mixed conifer forest or other wooded areas.

VIN – Vineyard. Small amounts of vine species planted in the study area, includes grapes and kiwi fruit.

OPEN WATER

CAN – Canal. Varies from large irrigation canals lined with concrete to small dirt-lined irrigation ditches.

LAK – Lake. Large bodies of water – mostly Lake Oroville, Thermalito Forebay and Thermalito Afterbay.

PON – Ponds. Small bodies of water. Ponds scattered throughout the Oroville Wildlife Area (OWA) are remnants of gravel mining and are lined with large cobble. Other smaller bodies outside the OWA include stock ponds, small reservoirs, and natural ponds.

Riv – Riverine. Intermittent to continually flowing water. Included Feather River and it's tributaries.

AQUATIC/SUBMERGED

ALA – Algae. Unknown species of algae floating near shore of small ponds in OWA and in backwater areas along the Feather River.

MAA – Mixed aquatic. Usually more than one species of aquatic vegetation present or identification to species isn't possible from aerial photos. Found along shores of small ponds in OWA and along backwater areas along the Feather River.

MFA – Mosquito fern. Species of *Azolla* floating near edges of ponds in the OWA.

WPA – Water primrose. Dense stands of the native water primrose (*Ludwigia peploides peploides*) cover vast areas in the OWA where water has some current. It is also found in pockets along the edge of the Feather River and in thicker pockets in the backwater areas. The non-native species *L. peploides montevidensis* occurs along the river and some canals, but not near as abundant as the native species.

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WMA – Water Meal. These small species of *Wolffia* sp. tend to form blankets across some of the ponds in the OWA, giving a lime green appearance to the water. It is also found in the back water areas of the Feather River